4G – Benefits Weigh over Uncertainties

India is a rare success story in telecom space where mobile networks have dared to infiltrate the rural landscapes where electricity, roads, railways, drinking water is yet to reach. A country of more than a billion people carries the pride of 76% teledensity. Even after two decades of existence, Indian wireless telephony is primarily driven by voice which contributes 90% of the revenue. Fierce competition and falling tariffs helped telecom operators to put mobile phones in the hands of poor from urban slums as well as rural hinterlands. Considering 2G revolution is not enough to achieve Indian government's social objectives of spreading literacy, financial inclusion, providing better health facilities etc, in the draft of New Telecom Policy 2012, government has set an objective to provide affordable broadband on demand by 2015, to achieve 175 million broadband connections by 2017 and 600 million by 2020, at a minimum of 2 Mbps download speed and making available 100 Mbps on demand. In remote areas, broadband connections are provided mainly through copper, optic fibre and Digital Subscriber Line (DSL). Using wireless broadband alongside the wired network will reduce the installation costs significantly.

4G Auctions, although expensive, 3G commanded a premium

Broadband Wireless Access (BWA or more commonly called as 4G) auctions were completed in June 2010 with six private players and two state players winning 66 licenses in 22 circles, limiting three players per circle. Collectively the licensees shelled out Rs. 385 billion in total for 20 MHz slot in 2.3 GHz range for private players and 2.5 MHz for state players.

Apart from Bharti and Aircel, no other major telecom player participated in the 4G auction, primarily on account of stretched balance sheets after spending huge sums of money on 3G auctions. Other reasons might be the fear of cannibalization of 3G subscribers by 4G as it offers better speeds than former and the lack of clarity on development of 4G ecosystem. Most of the telecom companies found that embracing 3G is natural transition to current 2G offerings due to voice compatibilities of 3G services and an established 3G ecosystem in terms of handsets, both of which lacked in case of 4G. Some of the operators might have opted out of the 4G auction to participate at a later stage to acquire 700 MHz spectrum because of the higher efficiency of the band and wider adoptability of spectrum especially in US leading to harmonization of ecosystem. As a result, 3G spectrum was auctioned at a premium to 4G, attracting a price of Rs. 33.5 billion per MHz compared to Rs. 6.4 billion per MHz for 4G, calculated on pan India basis. Though pan India costs for acquiring 3G and 4G licenses (along with the spectrums) did not have such a high differential (Rs. 168 billion and Rs. 128 billion respectively) as only 5 MHz of spectrum was allocated in case of 3G as against 20 MHz in 4G.

Will 4G go 3G's way?

More than a year after its launch, 3G adoption in India remains subdued at 10-12 million users due to various issues like poor network quality as operators are cash-strapped to spend on 3G expansion, low penetration of 3G enabled handsets, unavailability of local content, absence of

a killer application (similar to what SMS was for 2G) etc. Higher spectrum prices also forced operators to offer 3G services at a premium costing almost 5 times the existing GPRS/EDGE based data plans. That made Indian subscribers turn cautious about 3G resulting into less than 2% penetration despite 10-15% penetration of 3G enabled handsets. One of the other factors that go against 3G is allocation of just 5 MHz of spectrum as against 20 MHz in case of 4G. India has a very high subscriber density per Base Transceiver Station - BTS (more than 2,000 in metros) as compared to other countries. If sizeable proportion of it decides to opt for 3G, with very high data traffic compared to 2G, 3G networks will be congested very soon.

Globally, in most markets, 3G adoption picked up in the third year from the launch and we can expect that operators may improve the quality of 3G service in a year or two. Even assuming that 3G picks up in 2 years from now, most of the 3G users will be predominantly mobile users with a medium data requirement like accessing emails, web-portals etc leaving the space of other portable mobile devices like tablets, laptops, gaming consoles etc requiring high speed broadband for live HD video streaming, gaming etc unoccupied, paving the way for 4G.

Technology Choice – Wi-Max versus LTE

Worldwide, for 4G, Wi-Max is more widely adopted technology than Long Term Evolution (LTE) having a user base almost four times that of the latter but the latter is growing much faster than the former. North America (Verizon and AT&T in US), Japan and China are the major drivers of LTE worldwide. North America accounts for more than 40% of LTE's global set up. In India, out of the eight entities who bagged 4G licenses, only BSNL and MTNL have opted for Wi-Max platform whereas private players have made their intentions clear to go for LTE. The difference between Wi-Max and LTE is not as stark as GSM and CDMA apart from being promoted by two different associations - Institute of Electrical and Electronics Engineers (IEEE) and 3rd Generation Partnership Project (3GPP) respectively. Wi-Max has capacity to accommodate voice which LTE doesn't allow but LTE allows better integration with 2G and 3G as compared to Wi-Max.

Even in case of LTE, Indian companies have shown preference for LTE-Time Division Duplex (LTE-TDD) technology adopted primarily by Chinese players like China Mobile against LTE-Frequency Division Duplex (LTE-FDD) adopted by US and European countries. TDD is offered primarily in the above - 2 GHz spectrum range whereas FDD is offered in the sub-2 GHz spectrum. Absence of harmonization of spectrum and technologies leads to ecosystem issues as devices are not exactly compatible across the technologies. This may hamper the mass production of 4G-enabled handsets which is essential to make the devices affordable especially in emerging markets like India.

4G Gameplan of Indian Players		
Players	**4G License Areas**	**Progress on Roll out**
Reliance Infotel	Pan India - 22 Circles	Proposed roll out in 2012 but delayed couple of times. Have adopted LTE-TDD. Most probably partner with Network 18 for content.
Bharti Airtel	Kolkata, Karnataka, Maharashtra, Punjab	Has launched services in Kolkata and Bangalore (Karnataka). Has adopted LTE-TDD. Eying on Qualcomm's Mumbai and Delhi licenses. Partnered with ZTE for Kolkata, Huawei for Karnataka, Ericsson for Punjab and Nokia Siemens for Maharashtra.
Aircel	AP, TN, W. Bengal, Bihar, Orissa, Assam, N.E., J&K	Intends to start services in 2012. No specific plans disclosed yet.
Qualcomm	Mumbai, Delhi, Kerala, Haryana	Settled the dispute over licenses in March 2012. No specific plans disclosed yet.
Augere	Madhya Pradesh	Claims to be the first company to launch 4G in India on LTE-TDD. Has partnered with Ericsson.
Tikona	Gujarat, UP (E), UP (W), Rajasthan, HP	It already offers fixed broadband to households and corporate using WiFi technology. 4G roll out is in progress.
BSNL	20 Circles - All India except Mumbai and Delhi	Intends to surrender its BWA spectrum in some / all the 20 circles.
MTNL	Mumbai and Delhi	No specific plans disclosed yet.
Source: Industry and CARE Research		

Ecosystem challenge for 4G– Device support is lacking

Unlike 2G and 3G where spectrum bands were fairly uniform across various countries resulting into mass production of handsets bringing down the handset prices, 4G is offered in different frequency bands in different countries. Around one third of 4G subscribers today, predominantly in the US, served by Verizon and AT&T, are on 700 MHz band whereas Europe uses 2.6 GHz band. China and Japan are using 2.5 GHz and 2.1 GHz respectively. All the private players in India have received 4G spectrum in 2.3 GHz whereas BSNL and MTNL have it in 2.5 GHz. This puts limitations on interoperability of 4G devices across regions with different spectrum bands. This also leads to fragmented production of the devices (handsets, USB modems, tablets etc) leading to higher costs, at least at the beginning, until the OEMs come out with devices compatible with more 4G frequencies. Even in US, 4G enabled iPad is offered in two different specifications – one for AT&T for 700 MHz and 2100 MHz frequencies and another for Verizon with only 700 MHz frequency. The compatibility issues created a fuss in Europe and Australia as Apple introduced iPad 3 in these regions as a 4G ready device which is not capable of working on European and Australian 4G networks which run on 2.6 GHz and 1.8 GHz respectively, leading to refunds by Apple to some of the customers in Australia. Indian market, being on the other side of LTE as it has adopted LTE-TDD along with China as against LTE-FDD in US and a different frequency band 2.3 GHz as against 700 MHz in US, will struggle to

make cheaper versions of 4G devices available in the market. Also the chances of auctioning 700 MHz spectrum earlier than FY 2015 are rare in India going by TRAI's recent recommendations.

On the contrary, 3G technology is almost a decade old and is well adopted by most of the developed and emerging markets, with 3G penetration in key economies being 97% in Japan, 71% in Australia, 56% in US and 51% in UK. In India, most of the operators rolled out 3G services in the first half of 2011 though the adoption of 3G is very low (around 10-12 million subscribers). Worldwide 3G ecosystem is very well developed resulting in higher penetration of 3G enabled handsets. Even in India, around 10-15% handsets are 3G enabled though not all of the users have 3G subscription.

A 4G enabled mobile hotspot device popularly called as MiFi device which creates a mobile Wi-Fi around it in a small radius of few meters will be a ground-breaking device for adoption of 4G technology. These devices are mobile and portable (almost half the size of a smartphone). It allows multiple (can vary from 5-10) WiFi enabled devices including handsets, notebooks, MP3 players, portable gaming systems etc to be connected to this network. Going a step ahead, the new devices like 4G enabled iPad 3 on Verizon's connection can itself be used as a mobile hotspot offering connectivity to 5 WiFi enabled devices. Though the speeds available on such network will be lower than a direct 4G connection but it enables a non-4G enabled device to be connected to a 4G network reducing the urgency for a 4G enabled hardware ecosystem.

It can be seen from the chart below most of the devices, including dongles, routers, smartphones, tablets etc, are available on LTE-FDD that too in 700 MHz band due to adoptability of the same in US market. LTE ecosystem is evolving rapidly with 347 LTE devices by 63 manufacturers available in the market as in April 2012. Availability of LTE devices increased by 76% over a six month period from October 2011 to April 2012.

Global LTE Device Availability			
LTE-FDD		LTE-TDD	
Spectrum	Number of Devices	Spectrum	Number of Devices
700 MHz	142	2300 MHz	36
800 MHz	52	2600 MHz	41
1800 MHz	50		
2600 MHz	65		
800/1800/2600	43		
Source: Global mobile Suppliers Association and CARE Research			

4G remains a data only service in India; VoIP is yet to arrive

4G, unlike 3G, does not offer Voice-based services through mobile networks but as Voice-over-Internet-Protocol (VoIP). The main difference between normal telephony and internet telephony is that in normal telephony, circuit switching technology is used, whereas Internet Telephony is based on packet switching technology. In the developed markets like US and Sweden where 4G has been rolled out, it is offered as a data only package, integrated with 3G packages for voice. In short, a user who is logged on to a 4G network will be seamlessly transferred to a 3G network the moment he

receives a voice call. Voice-over-LTE (VoLTE) is a new form of VoIP and is under trial phase in some of the countries.

In India, not all the 4G service providers have the option to provide seamless 4G and 2G/3G service offering both data and voice services on the same handset as only Bharti, Aircel, BSNL and MTNL among 4G licensees have 2G/3G licenses. This could be possible in future if government accepts TRAI's recommendation to make the spectrum technology neutral allowing the operator to provide 2G, 3G or 4G services using the same spectrum. As there is no clarity whether VoIP will be allowed fully in India, currently 4G services are limited only for data related usage.

Addressable Market for 4G - Trinity of Internet, Video and Television

India's success in wireless telephony has been predominantly restricted to voice due to various reasons like lower literacy levels (74% overall and 11% English), lower internet user-base (<10%), lower PC penetration (~4%), unavailability of local language data content, lower Average Revenue per User per month (ARPU <Rs. 100) for 2G telephony due to lower affordability. As 4G promises high speed broadband that too without voice, prima facie the potential market for 4G seems limited to 100 million internet users and another 15-20 million additional users from groups like gamers, tablet-users etc. As we go deep into the success of any technology, for most of them the market exploded once the initial barriers like cost, supply, user-friendly technology etc are crossed. A decade back, no one expected that there would be any scope for one more technology like CDMA in India assuming that the market was saturated with a teledensity of 10-15%. But once the barrier of affordability was smashed, the same technology made inroads capturing more than 30% of subscriber base at its peak.

Lower internet penetration in India arises out of higher cost of ownership of PCs which requires an initial investment of Rs. 20,000 along with other issues like inconsistent power supply, space requirement of at least 4 sq. ft etc. The next best options like laptops are equally expensive and delicate to handle, leaving them for corporate class and post-graduate students from technical and management streams. Also the lack of local content on internet is one of the major grounds for under-penetration of internet in India. On the contrary, a low cost tablet which is customized with suitable applications (apps), probably with a language option to convert into regional languages, along with reasonably priced 4G connection is a formula for success for Indian markets. Unlike a PC or a laptop, tablets can be a lot cheaper starting from below Rs. 2,000 level if we go by pricing offered by Aakash tablet (though 4G enabled tablets might cost more due to lack of mass production). In that case, cost and portability will be the biggest advantages for most of the target user groups like students, salesmen, SMEs, etc. This demand is in addition to the existing internet subscribers which are potential targets for 4G offered via USB modems and wireless gateways. One never knows, 4G might be the technology that will make the demand for tablets explode in India.

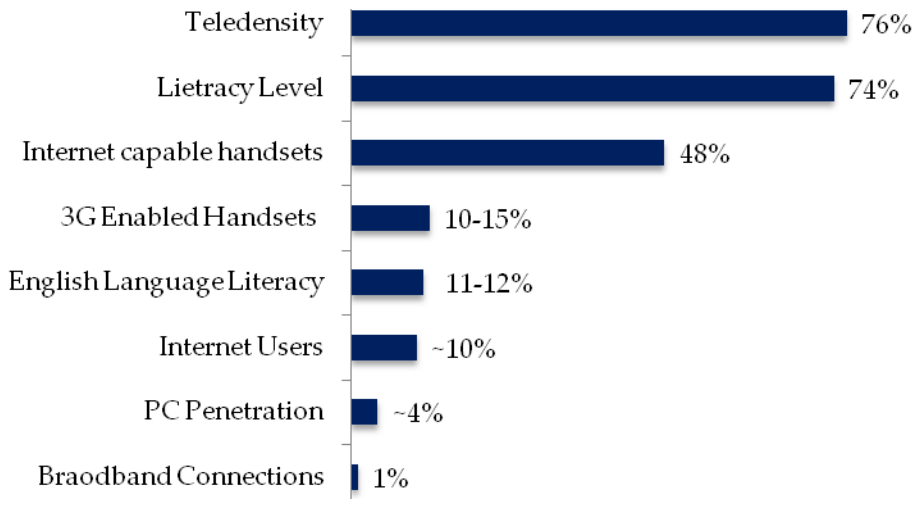
In spite of this, the fact remains that data usage has never picked up in India like voice. Other utilities offered by a mobile phone like news updates, emails, chats, utility services like banking etc could not fascinate telecom subscribers in India to the extent that they are willing to pay a premium to experience them at faster speeds (like 3G's case). We believe that beyond voice communication the

biggest motivator for Indian masses would be video or rather video-on-demand. TV Viewership in India is just below mobile penetration and is the most popular medium of entertainment. With the advent of 4G, coupled with a low cost tablet and localized video content can be a game-changer in the Indian telecom as well as entertainment industry. To some extent, video-on demand on a 4G enabled tablet partially overcomes the disadvantages like choice of content, privacy, inconsistent power supply which leads to interruptions in the TV programs etc. So it can be safely predicted that video will be the next best product to sell to Indian customers, after voice and it also generates enough traffic on the network to generate enough volumes for the operators.

Doing a small extrapolation, there can also be a scope for 4G entering the living rooms of entertainment-hungry Indian households via a set top box. Out of the Rs. 300 billion TV industry in India, a small pie would mean a sustainable market for 4G players, as against selling pure data. A 4G enabled set-top box would allow Indian user to view video-on demand on his television besides the regular TV content. Some of the 4G licensees are going for tie ups with media companies to provide exclusive content to their 4G users. In the end, video looks to be the shortest, fastest and safest route to bring Indian subscribers closer to 4G.

Next to videos, what can attract Indian subscribers more is gaming. Mobile Gaming industry in India is expected to reach Rs. 14 billion by 2014 from Rs.2.4 billion in 2010. With burgeoning young population, Indian youngsters will show a preference for group gaming, spending more time in gaming cafes or playing games in a group, maybe at homes. A 4G based mobile hotspot can offer a convenient tool to provide faster speed for gaming cafes as well as individuals in their homes.

Literacy, Mobile and Internet Penetration in India



Source: TRAI, Census, Industry and CARE Research

4G will bring fruits of *Cloud Computing* to Indian SMEs

On the corporate side, around 26 million SMEs in India offer a huge potential market for 4G as most of the SMEs lack affordable high-speed Internet service (broadband) in India, particularly in Tier II and Tier III cities. This is one of the prominent reasons for lack of widespread adoption of e-

commerce by local businesses. From travelling sales force to accounts sections using internet banking, 4G offers a promise for improvement in business at each level for an SME.

As cloud computing gathers steam, SMEs can use IT infrastructure including hardware like servers and platforms like Customer Relationship Management modules on pay-as-you-use basis rather than owning the infrastructure. 4G offers the vital link at faster speeds and affordable rates that can connect the IT system of SMEs to the clouds of service provider. Indian cloud computing market is expected to reach $16 billion by 2020, according Nasscom and 4G will be the key for the growth of cloud computing as it has the capacity to carry the huge amount of data needed to be transferred from the clients end to the host server.

Stable growth prospects, lower operating costs support business model

Unlike 2G that has stuck up in linear revenue growth implying additional revenue coming primarily with proportional increase in subscribers as ARPUs are stagnated, 4G has fairly non-linear model with prospects of higher profitability as ARPUs are expected to be a lot better than 2G. Also, the limited competition in the sector, as there are just 3 players in a circle today, will help in holding tariffs unlike 2G. Millions of SMEs in India should potentially offer a stable and high volume market for 4G operators.

On the cost front, operating costs of 4G network are comparatively lesser than those for 2G and 3G, as 4G is the most advanced technology. As 4G is IP based technology, BTS are believed to be cheaper than 3G and are more compact and robust as compared to 2G BTS. There are considerable amount of savings as this BTS can be used outdoor without air conditioning and consumes less power as compared to 2G and 3G BTS, bringing down the energy expenses which constitute nearly 30% of network operating costs.

Conclusion

When 3G was launched in India more than a year back, the USP was faster internet, video calling, live streaming of videos etc. Now 4G is being launched with a much faster internet without voice and without a developed ecosystem. The next couple of years will see a clash between the two technologies as most of the operators offering these services are different. Although superficially it looks like these two technologies offering the same user experience with some plus and minus might cannibalize each other, a deeper gaze tells us that the two technologies can co-exist albeit not in separate silos. As seen in the developed markets, 3G will be a more voice and moderate data intensive service which will be a natural transition to existing 2G users whereas 4G will be predominantly data intensive technology replacing other broadband services. A target group of 30 million postpaid subscribers, who on an average pay more than Rs. 500 a month as their mobile bill, almost 5 times their prepaid peers, 431 million subscribers who have internet ready handset but not all of them are active and around 100-120 million out of these carrying a 3G enabled handsets offer a sizeable target group for 3G services. On the other hand, more than 100 million internet users in the country, 100s of thousands new tablet users being added every year and millions of potential TV viewers waiting for the cheaper video-on-demand facility in their drawing rooms, and 100s of thousands SMEs waiting for the right internet connectivity offer the target group for 4G services.

CARE Research therefore feels that in India, in the race of technologies, 4G will be a serious contender.

Contact:

Revati Kasture	*Divyesh Shah*	*Anand Kulkarni*
Head - CARE Research	***Asst General Manager***	***Dy. Manager***
revati.kasture@careratings.com	*divyesh.shah@careratings.com*	*anand.kulkarni@careratings.com*